BALLISTIC MISSILE DEFENSE ORGANIZATION (BMDO)
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
Submitting Proposals - Instructions

Send Phase I proposal packages (the unbound original, to make extra copies, and six bound copies, to immediately forward to evaluators, of the full proposal, PLUS one additional copy of Appendices A and B only) by US mail (or any commercial delivery service). Also, APPENDIX E needs only to be with the unbound original. DO NOT attach APENDIX E to the six bound copies. The mailing address follows and the BMDO SBIR website address is provided.

Ballistic Missile Defense Organization
ATTN: TOI/SBIR (BOND)
1725 Jefferson Davis Highway, Suite 809
Arlington, VA 22202

For Administrative HELP ONLY call: 800-937-3150 or 800-WIN-BMDO
Internet Access: www.futron.com/bmdo/sbir.html

Proposals delivered by other means will not be accepted. Proposals received after the closing date will not be processed. BMDO will acknowledge receipt of proposals IF AND ONLY IF the proposal includes a self-addressed stamped envelope and a form that needs only a signature by BMDO. All proposal submission appendices may be downloaded from the DoD SBIR Website at (http://www.acq.osd.mil/sadbu/sbir/appendcs.htm). Furthermore, all companies are strongly encouraged to upload their APPENDIX A and APPENDIX B only, through the BMDO SBIR Website at (http://www.futron.com/bmdo/sbir.html). Uploading the two appendices will allow BMDO to process proposals faster so that evaluations can be received quickly. It is in the companies best interest to upload their APPENDIX A and APPENDIX B since those proposals will be processed first.
The intent of BMDO, first and foremost, is to seek out the most innovative technology that might enable a defense against a missile in flight -- lighter, faster, stronger, more reliable technologies are all of interest. Proposers need not know specific details of possible BMDO systems, research and development goals, or specific technology needs or requirements, but must understand that potential technologies should have application to ballistic missile defense at some level. (A better fire extinguisher, although it may be innovative and there is a commercial market, does not support ballistic missile defense requirements at any level.)
Specifically, BMDO seeks to invest seed-capital, which supplements private sector investment support, in a product with a future market potential (preferably private sector) and a measurable BMDO benefit. BMDO SBIR will not support or further develop concepts already mature enough to compete for private capital or for mainline government research and development funds. Phase I proposals should focus on the innovation of the proposed technology, it should illustrate the concept feasibility, and the merit of a Phase II for a prototype or at the very least a proof-of-concept. Phase II competition will also be judged intensely on future market

possibilities and commercialization potential. Phase II proposals may be submitted anytime after the Phase I begins. Unique efforts showing time sensitivity or submitted for FasTrack will be given due consideration for Phase II start-up funding and Phase I proposals may include a post-Phase I optional tasking that will permit rapid start-up if the Phase II or FasTrack application is approved. BMDO is currently developing its own FasTrack procedures, incorporating the central principles of the Fast Track policy (Section 4.5), subject to approval by the Under Secretary of Defense for Acquisition and Technology this fall. Once approved, the BMDO procedure may be found at the website address under the Frequently Asked Questions (FAQs) section.

Principal Investigators who are tenured faculty are NOT considered primarily employed by a small firm if they receive compensation from the university while performing the SBIR contract; any waiver must be requested explicitly with a justification showing a compelling rational and national need; BMDO expects to grant no waivers.

BMDO intends for a Phase I to be only an examination of the merit of the concept or technology with an average cost under $65,000. Although proposed cost will not affect selection for negotiation, contracting may be delayed if BMDO reduces the proposed cost. DO NOT submit the same proposal, or variations thereof, to more than one BMDO topic area; each idea will be judged once in an open competition among all proposals. Furthermore, BMDO performs numerous cross-reference checks within each solicitation.

Because BMDO seeks the best nation-wide experts in innovative technology, proposers may suggest technical government reviewers by enclosing a cover letter with the name, organization, address, phone number, and rationale for each suggestion. BMDO promises only to consider the suggestion and reserves the right to solicit other evaluations.

BALLISTIC MISSILE DEFENSE ORGANIZATION TOPICS

BMDO98-001 Directed Energy Concepts and Components

BMDO98-002 Kinetic Energy Kill Vehicles and Components

BMDO98-003 Sensors

BMDO98-004 Unit Cost Reduction (unavailable in FY98)

BMDO98-005 Non-Nuclear Power Sources and Power Conditioning

BMDO98-006 Propulsion and Logistics Systems

BMDO98-007 Thermal Management

BMDO98-008 Survivability Technology

BMDO98-009 Lethality and Vulnerability

BMDO98-010 Computer Architecture, Algorithms, and Models/Simulations

BMDO98-011 Optical Computing and Optical Signal Processing

BMDO98-012 Structural Concepts and Components

BMDO98-013 Structural Materials and Composites

BMDO98-014 Electronic Materials

BMDO98-015 Superconductivity Concepts and Materials

BMDO98-016 Surprises and Opportunities

BMDO FY98 TOPIC DESCRIPTIONS

BMDO 98-001 Directed Energy Concepts and Components

BMDO seeks innovative and applied research toward advanced technology developments in the generation, propagation, and detection of directed energy in all forms. Dual-use systems under consideration include, but are not limited to, solid-state lasers (i.e.diode lasers), chemical lasers, excimer lasers, IR/Vis/UV lasers, x-ray lasers, gamma-ray lasers, free electron lasers, quantum lasers, particle beams, radio-frequency (RF) and millimeter wave (MMW), and other unique hybrid approaches. Furthermore, any component or subcomponent that is utilized by any of these systems is of interest. Included herein are such topics as beam control, target acquisition, tracking and pointing, mirrors, beam propagation and steering, optics, conversion methods, countermeasures and coatings, micro-optical devices incorporating these aspects.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company A whose advanced x-ray source is being utilized for waste sterilization was sponsored from this topic. Company B utilized their tunable filters with the citrus industry and for military hyperspectral image applications.

DoD Key Technology Areas: Electronic Warfare/Directed Energy Weapons, Electronics

BMDO 98-002 Kinetic Energy Kill Vehicles and Components

Kinetic energy (KE) weapons candidates presently include a variety of ground and space based interceptor concepts including their propulsion sub-system components. System elements include ground-based launchers, axial and divert motors/nozzles, smart projectile components, and endo/exoatmospheric guidance and control mechanisms. Technology challenges for KE systems include: finding the booster hardbody within the plume, high performance axial and divert propulsion sub-systems (especially very low mass divert systems), miniature inertial navigation units, array image processing, C.G. Control algorithms, fast frame multicolor and ultra-violet

Seekers, acquisition and track; target discrimination, seeker operational environments, lethality/miss distance; aero-optical effects, guidance and fuzing accuracy, shroud separation, window thermal-structural integrity, non-nuclear kill warhead performance, target acquisition in a hostile environment, performance and survivability of electronics in a hostile environment; firing rate, projectile guidance and control and projectile launch survivability; and, common among all systems reliability, producibility, safety (non-hazardous operation), maintainability, and low cost/low mass; aeroshell ablation control; electromagnetic launches. Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company C advanced the metal armature developments for military railgun efforts. Company D began with a bone implantation technology and international investments that resulted from divert motor rocket nozzles. Company E, with a market cap of $20M+, expanded with technology genesis to a dynamic frame seeker and chip-stacking developments. Company F, with a market cap of $240M+, supported ballistic missile defense efforts with their enhanced lethality kinetic energy projectile.

DoD Key Technology Areas: Air Vehicles/Space Vehicles, Conventional Weapons

BMDO 98-003 Sensors

Sensors and their associated systems/sub-systems will function as the "eyes and ears" for ballistic missile defense applications, providing early warning of attack, target detection/classification/identification, target tracking, and kill determination. New and innovative approaches to these requirements using unconventional and innovative techniques are encouraged across a broad band of the electromagnetic spectrum, from radar to gamma-rays. Passive, active, and interactive techniques for discriminating targets from backgrounds, debris, decoys and other penetration aids are specifically sought. Sensor-related device technology is also needed. Examples of some of the technology specific areas are: cryogenic coolers (open and closed systems), cryogenic heat transfer, superconducting focal plane detector arrays (for both the IR and sub-mm spectral regions), signal and data processing algorithms (for both conventional focal plane and interferometric imaging systems), low-power optical and sub-mm wave beam steering, range-doppler lidar and radar, passive focal plane imaging (long-wavelength infrared to ultra-violet; novel information processing to maximize resolution while minimizing detector element densities), interferometry (both passive and with active illumination), gamma-ray detection, neutron detection, intermediate power frequency agile lasers for diffractive beam steering and remote laser induced emission spectroscopy, lightweight compact efficient fixed frequency radiation sources for space-based ballistic missile defense applications (uv-sub-mm wave), new optics and optical materials. Entirely new and high-risk approaches are also sought. Please indicate the particular subtopic identifying letter your specific proposal/technology addresses:

BMDO98-003A - Acoustic and Seismic
BMDO98-003B - Radar and MMW
BMDO98-003C - UV (<0.3 microns)
BMDO98-003D - Visible (0.3 - 0.9 microns)
BMDO98-003E - IR (>0.9 microns)
BMDO98-003F - Gamma/X-Ray
BMDO98-003G - Other

Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company G, with commercial sales of $15M+, is noted for its laser diode pumped q-switched solid state laser products. Company H, with a market cap of $24M+, transferred its microwave based infrared detector and superconducting millimeter wave mixer technologies for a variety of cryogenic systems and products. Company I's high power laser array transmitters are utilized on future military satellites for communications.

DoD Key Technology Areas: Sensors, Electronics

BMDO 98-004 Unit Cost Reduction (unavailable in FY98)

BMDO anticpates no technology requirements under this topic for this year.

BMDO 98-005 Non-Nuclear Power Sources and Power Conditioning

New technologies for providing power which provide substantial improvements in lower recurring cost, lower mass, and/or smaller size are sought for all ballistic missile defense applications. New concepts for power sources and power conditioning devices for transportable or mobile systems at 200 kW to 1 MW also need to have high efficiency, low signatures, and high reliability. Power generation and power conditioning devices that operate at cryogenic temperatures for use in a new concept for all cryogenic systems are sought. Power conditioning devices of interest include, but are not limited to, capacitors, inductors, and switches. Space assets' power sources in the 0.5 to 5 kW power range, including solar arrays and their photovoltaic cells, need to tolerate high natural radiation levels. Satellite energy storage systems or novel battery technologies must provide cycle lifetimes of up to 40,000 cycles and may be utilized in low earth orbit sensor satellites. Onboard power sources for interceptor missiles need to be periodically testable and have a quick start-up capability. Power conditioning systems and components for space assets should provide very high efficiency. Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company K, with a market cap of $48M+, has provided for commercializing its self-restoring fault current limiter after it was incorporated into military

efforts.

DoD Key Technology Areas: Aerospace Propulsion and Power

BMDO 98-006 Propulsion and Logistics Systems

In general, missile defense places unprecedented demands on all types of propulsion systems; launch to low earth orbit, orbit transfer, orbit maneuvering, and station keeping. Specifically, advancements are needed to achieve major reductions in the costs of placing and maintaining payloads in desired locations. Approaches leading to techniques, methods, processes, and products in support of these propulsion and logistics objectives are sought. Propulsion approaches include liquid, solid, and electric. Advancements are needed in propulsion-related areas, e.g. extending storage time of cryogenic fluids (e.g. H2 and Xe), reduction of contamination from effluents, and sensors and controls for autonomous operation. Areas of interest include the entire spectrum of space transportation and support: efficient launch systems for small technological payloads as well as full system payloads, assembly, and control systems; expendable and recoverable components; improved structures and materials; and increased propulsion efficiency. In anticipation of solar power demonstration missions incorporating electric thrusters, BMDO seeks high power electric thruster modules (e.g., electrodes, insulators, ignition systems, propellant controls, command and control systems, thermal management systems, and power conditioning units). With the advent of small surveillance satellites, low power (0.5 to 2 kW) electric propulsion is under consideration for station keeping and orbit transfer; for such systems emphasis is being placed on achieving higher power densities for components of the integrated system (thruster, power conditioning unit, fuel control, gimbals, and fuel storage). Low mass or miniature interceptors require advances in divert (small thrusters) propulsion systems (either solid or liquid).

Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company L, with a market cap of $25M+, developed a laser radar tracking technology that finds commercial use in laser eye-surgery applications, but was also investigated for tracking ballistic missiles in flight.

DoD Key Technology Areas: Aerospace Propulsion and Power, Air Vehicles/Space Vehicles

BMDO 98-007 Thermal Management

Higher power levels of various ballistic missile defense assets must dissipate heat at state-of-the-art capabilities for waste thermal energy acquisition, transport, and dissipation to space. Technology advancements are required in thermal management for power generation systems, space platform payloads, and all associated electronics. Some space platforms will require years of storage of large amounts of cryogen with minimum

cryogenic loss and high cryogen delivery rates under condition of zero-g. Concepts, devices, and advanced technologies for all types of space-based power cycles are sought which can satisfy these projected ground/air/space platform requirements.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Currently addressing electric vehicle technology applications for military and commercial interest, Company M got its initial start, and now with a market cap of $75M+, with active magnetic vibration isolation controls funded under this topic.

DoD Key Technology Areas: Electronics, Air Vehicles/Space Vehicles

BMDO 98-008 Survivability Technology

Missile defense elements must operate and survive against determined attacks. Threat actions can generate a reasonable set of hostile man-made environments before and during operations. Collateral environments and natural space environments (atomic oxygen, space radiation and micrometeorites/debris) provide additional technical challenges which also affect civilian assets. Survivability engineering technology and survivablility enhancement options are required to achieve a cost-effective, yet integrated solution to a dynamic and diverse set of hostile environments with a focus toward improving aspects of threat sensing, hardening, passive defense, and camouflage, concealment and deception (CCD).
Sensor technologies enable the defense elements to detect nuclear events, laser and radio frequency weapon attacks, and to respond appropriately. Sensor technologies which can characterize the threat according to direction of attack, and spectral characteristics are currently under consideration. Technologies to enhance passive defense missile systems, ground/air/space assets, and support equipment are needed to operate against the threat support sensors, including radar, passive visible/IR sensors and seekers, and laser radar.
Passive hardening against the nuclear, laser, RF, ballistic and debris environments is specifically needed, in addition to novel hardening technologies and approaches against the natural space environments. Sensor technologies and their associated systems, communications antennas (RF and laser), attitude sensors, solar power, propulsion, structure and thermal control are all directly exposed to nuclear, laser, RF and debris in addition to the natural space environments. Materials and component designs which are intrinsically hard to these environments, and/or protective devices are needed, specifically with dual-use commercialization applications. A key ballistic missile defense area of consideration is seeker/sensor subsystems, the components of which (baffle materials, mirrors, optics, structures, focal plane arrays, read out electronics, and processing) must survive the laser, nuclear, IR, and natural environments. Nuclear and laser hard concepts, materials, and devices for protection against unknown or agile lasers and rejection of RF energy. Structures and coatings providing appropriate thermal characteristics, stability under mechanical impulses and

hardness to laser and RF radiation are needed. Processors capable of operating in unique hostile environments presented by the strategic applications while retaining full functionality are desired. Long term space (commercial and government) applications are direct beneficiaries of these advanced technology developments.
Countermeasures and integration of CCD technologies are particular useful to the operational forces and, in general, attempt to incorporate the latest military and commercial technologies to ensure an effective response to any advanced threat. A new class of weapons technologies are evolving incorporating non-lethal methods. These have a broad range of applications as a survivability countermeasure or must themselves be countered to assure full operability. The non-lethal technology efforts in this area have dual-use applications with law enforcement techniques.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company N, with a market cap of $170M+, got started with its hardened electronics for military environments. Company O markets holographic products to the commercaial market that started with rugate filters for sensor protection of optics on military platforms.

DoD Key Technology Areas: Electronics, Sensors, Surface/Under Surface/Ground Vehicles

BMDO 98-009 Lethality and Vulnerability

A major factor in determining the effectiveness of a ballistic missile defense is the lethality of the directed energy and/or kinetic energy devices used against responsively hardened targets, bulk powder, and submunition targets. Battlefield by-products of post-intercept events are currently under consideration. New concepts and technologies which produce a much higher probability of hit-to-kill intercepts is required to support applications. Ground and Point-of-Intercept technologies, instrumentations, concepts, and innovative methodologies are under consideration for cost effective incorporation into BMDO lethality efforts. Additionally, novel concepts and techniques which reduce the vulnerability of ballistic missile defense systems will increase the operational confidence level of dedicated assets. Commercial applications may benefit from the incorporation of the techniques utilized in cost-reduction, measurement and diagnostics, and meteorology instrumentation packages.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company P was started after receiving initial funding under this topic for its solid state optical devices, which are now commercial products.

DoD Key Technology Areas: Conventional Weapons

BMDO 98-010 Computer Architecture, Algorithms, and Models/Simulations

Missile defense systems for battle management demand order-of-magnitude advances. A system must acquire and track thousands of objects with hundreds of networked

sensors and data processors, direct weaponry to intercept targets, and determine the degree of kill. Areas of specific interest include:
- New computer architectures which are robust, compact, and fault-tolerant, but allow for the extremely rapid processing of data. Architectures may be implemented by new designs or innovative applications of existing technologies, such as optical signal processing, systolic arrays, neural networks, etc.
- Very high-level language (VHLL) design for both the development and testing of extremely large software systems.
- Novel numerical algorithms for enhancing the speed of data processing for sensing, discrimination, and systems control. These may be specifically tailored to a particular task (for instance, the execution of a phase retrieval algorithm for interferometric imaging) and may include neural networks.
- Language design to develop code optimized for highly parallel processed architectures.
- Testing techniques that will provide a high level of confidence in the successful operation of concurrent, real-time, distributed large-scale software systems. Examples include sensitivity analysis, data flow testing, mutation testing, static concurrency analysis, and dependency analysis.
- Computer network and communications security. R&D for trusted computer systems in accordance with DoD 5200.28.STD; integration of COMPUSEC with COMSEC (DoD 5200.5).
- Self-adaptive processing and simulation. Algorithms and architectures for advanced decision making.
- Neurocomputing and Man-Machine Interface - rule-based artificial intelligence and neural networks combined for decision making flexibility and system robustness; development of decision trees and information display for highly, automated, short response time, training adaptive high volume scenarios.
- Software architectures for embedded computer networks that especially facilitate incremental system and software integration, hardware and software maintenance, and system evolution, without significant performance degradation.
- Hardware and software self-diagnostic capabilities for monitoring the operational readiness and performance of space and ground systems incorporating embedded computer networks.
- Virtual environments to allow diverse groups to interact in real time and increasingly realistic ways over large distances which may include hostile environments definition and ground effects modeling and simulation efforts.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company Q, with commercial and military sales of its automatic parallelization tool for sequential programs, marketed as INSURE++ and CodeWizard for Java, is in excess of $10M/year.

DoD Key Technology Areas: Battlespace Environments; Computing and Software; Human Systems Interface; Manpower, Personnel and Training; Modeling and Simulation

BMDO 98-011 Optical Computing and Optical Signal Processing

Dense computing capability is sought in all architectural variations, from all optic to hybrid computers. Specific examples of areas to be addressed include, but are not limited to, high speed multiplexing, monolithic optoelectronic transmitters, holographic methods, reconfigurable interconnects, optoelectronic circuits, and any other technology contributing to advances in intra-computer communications, optical logic gates, bistable memories, optical transistors, and power limiters. Non-linear optical materials advancements and new bistable optical device configurations.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company R took a unique technology approach in addressing fiber-optic and other optical communications applications to both the military and commercial industry. Company S is providing a low-loss electro-optical switching array, Company T is providing optical bus extenders and fiber-optic modulators, Company U has funded technology which utilized wavelength division multiplexing techniques; all to support the ever growing optical communication industry.

DoD Key Technology Areas: Command,Control and Communications; Computing and Software; Electronics

BMDO 98-012 Structural Concepts and Components

Minimum weight structures are needed in ballistic missile defense applications to withstand high-g loading, acoustic and thermal environments of ground based interceptors, and to provide solid bases for space systems pointing and tracking. Such structures will benefit from: (1) innovative vibration control techniques, (2) innovative fabrication approaches to cut structure cost, and (3) innovative use of advanced materials and/or design approaches to minimize structure weight. For instance, techniques and experimental verification are needed for active and/or passive methods to measure and control vibrations caused by thermo-mechanical flutter, thruster firing, or structure borne noise caused by on-board mechanisms. "Active" structural elements containing materials and electronics to provide predictable mechanical displacement in response to applied electrical signals are of interest. Maximization of displacement, mechanical strength, and reliability; parameter stability over extended temperature ranges; and minimization of driving voltage, power, and weight of these elements are desired. Producibility improvements for curved actuator elements, flextensional, and other integrated motion amplifiers are of interest. Fabrication approaches that provide minimum weight with reduced assembly, inspection, and scrap rates for conventional, advanced composite, and "active" structures are needed to reduce costs. Of course, novel designs and material usage to reduce structure weight, while maintaining or increasing capability, are always desirable goals
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company V took its ultrasonic motor technology to the commercial industry and that motor can now be found in assorted novelty and gift items. Company W, with a very accurate and precise gimbal for military laser

communications, also has sales to the commercial optical industry.

DoD Key Technology Areas: Material, Processes and Structures; Manufacturing Sciences and Technology

BMDO 98-013 Structural Materials and Composites

Many of the anticipated structural advances sought will depend on major improvements in materials properties and cost effectiveness. Space structures supporting seekers and antenna must accommodate retargeting maneuvers without detrimental jitter from vibrations and thermo-mechanical flutter. Surface launched interceptors must withstand high-g loads, aerothermal heating, and structural vibration without compromising tracking accuracy. Lightweight materials are very beneficial for both ground and space based systems. Specific goals require advanced techniques and processes that include imparting oxidation resistance and damage tolerance to composites and creating high elastic modulus composites for use over a broad range of temperatures. The following are specifically sought: (1) innovative manufacturing methods for producing high modulus, fiber-reinforced glass, light metal (i.e. aluminum or magnesium), or resin matrix composites; (2) innovative procedures for the production of instrumentation, sensors, and software for on-line process monitoring and evaluation of high modulus, fiber-reinforced composites during fabrication; (3) novel approaches to tailor fiber/matrix interfaces to maximize capability in advanced composites; (4) novel methods to cut fabrication cost of metallic and/or composite spacecraft and interceptor structures; (5) innovative tooling techniques for near-net shape production of advanced composites; (6) novel low-to-no outgassing joining/bonding techniques for advanced composites; (7) innovative surface modifications to promote wear resistance; (8) new methods for integrating instrumentation (e.g., embedded sensors) into advanced composite materials and structures; and (9) novel instrumentation for determination and telemetry of material properties and data from space. Advances are also sought in materials for optical system components, mechanical moving assemblies, and protective coatings.

Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company X has commercial sales of $16M+ for its solid lubricants for space structures for both military and civilian applications.

DoD Key Technology Areas:Materials, Process and Structures; Manufacturing Sciences and Technology

BMDO 98-014 Electronic Materials

The necessary advances in electronics for the many ballistic missile defense applications will require advances in electronics materials. Primary emphasis lies in advancing the capability of integrated circuits, detectors,

sensors, large scale integration, radiation hardness, and all electronic components. Novel quantum-well/superlattice structures which allow the realization of unique elective properties through "band gap engineering" are sought as are new organic and polymer materials with unique electronic characteristics. In addition, exploitation of the unusual electronic properties of gallium nitride is of considerable interest. Among the many BMDO electronic needs and interest are advances in high frequency transistor structures, solid state lasers, optical detectors, low dielectric constant packaging materials, tailored thermal conductivity, microstructural waveguides, multilayer capacitors, single-electron transitors, metallization methods for repair of conducting paths in polyceramic systems, and sol-gel processing for packaging materials.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company Y, with a market cap of $210M+, commercialized technology that allowed for the delivery of ultra-pure materials to semiconductor thin film reactors. Company Z, with a market cap of $14M+, manufactures radiation detection devices and was funded for avalanche photodiode arrays. Company AA, with a market cap of $97M+, has a substantial market share of the atomic layer epitaxy growth method of semiconductor compound materials based on efforts funded under this topic. Company BB, with a market cap of $155M+, which manufactures flat panel display devices, received some initial funding for their silicon-on-insulator films and organometallic chemical vapor deposition technology developments. Company CC, with a market cap of $200M+, commercialized technology based on degradation resistant laser diodes. Company DD, with a market cap of $14M+, is in the process of commercializing technology based on its surge suppression devices. Company EE, with a market cap of $265M+, had initial funding for its high bandgap compounds and laser diode products to develop a number of commercial and military products. Company KK established a multilayer coating technology that can be easily transported to any location for application. Company FF developed a magnetoresistive non-volatile random access memory chip which is also radiation hardened and is utilized in a number of space applications for the military and commercial sectors.

DoD Key Technology Areas: AirVehicles/Space Vehicles; Electronics; Electronic Warfare/Directed Eneregy Weapons; Materials, Processes and Structures; Sensors; Surface/Under Surface/Ground Vehicles

BMDO 98-015 Superconductivity Concepts and Materials

BMDO is interested in demonstrating both high temperature superconductor (HTS) and low temperature superconductor (LTS) devices to enable or improve strategic defenses. Emphasis in HTS technology focused toward components integrated with state-of-the-art cryoelectronics for communications systems at K- and S-bands and radar systems in the X-band power and inductive energy storage are of specific ballistic missile defnese interest. The demonstration of HTS materials toward limited detection of

radiation in the optical, IR, MWIR, and LWIR bands as well as for signal processing applications is also of interest. The emphasis in LTS technology is in the development and demonstration of high sensitivity detectors, digital electronics, and memory enabling on-focal plane array signal processing and operating at temperatures greater than 10K. Efforts should address packaging and interface issues and systems integration with cryocoolers and stored cryogens. Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company GG, with a market cap of $45M+, fabricates optical components for industrial and military applications finds traceability back to superconducting detectors funded under this topic. Company HH, with a market cap of $43M+, demonstrated success from its technology based on multi-GHz superconducting shift registers.

DoD Key Technology Areas: Electronics; Sensors

BMDO 98-016 Surprises and Opportunities

Since ballistic missile defense is an exploration at technology's leading edge, it recognizes that surprises and opportunities may arise from creative and innovative minds. BMDO will consider proposals in other technologies where they present an unusual opportunity for ballistic missile defense applications. The proposer should take special care to describe the technology in complete detail and specify why ballistic missile defense applications would benefit from exploring its unique and novel implications. Proposers should make special note that proposals in this topic will receive preliminary screening at BMDO that may reject them as too far afield without the benefit of a full technical review received by proposals in the topics already listed. It is recommended that the proposer focuses their submission toward one of the specific outlined topics above unless the technology proposed is truly an unquestionable innovation. This full and open call is for new/novel/innovative advanced technology development, and not for the recycling of old ideas, incremental advancements, or questionable improvements.
Successful Phase 3/Dual-Use Commercializers (Real-World Examples): Company JJ, with a market cap of $740M+ (The largest of any BMDO SBIR recipient.), was funded for technology to further its intelligent client-server software solutions for mission-critical decision applications in real-time military and commercail environments.

DoD Key Technology Areas: Any potential new development may address a DoD Critical Technology Area from this topic, provided it supports BMDO mission interest at some level.